

EVIDENCE-BASED DESIGN DECISIONS TO PROMOTE SOCIAL INTERACTION FOR  
ADOLESCENTS IN HEALTHCARE ENVIRONMENTS

by

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### Abstract

Adolescents do not fit into the normal hospital structure. They are too mature for the childish aesthetic and activities of the pediatric wing, yet they cannot follow the rules and regulations of the adult areas. This design focuses on creating social spaces within the hospital to foster interaction and community amongst the patients. The result is a new hospital wing and patient room prototype. This new design promotes social interaction and responds to adolescent aesthetic preferences, so that those confined to their rooms still benefit from the social and visual stimulation needed for this age group. Named Shift, the design prototype incorporates daylighting, designated lounge spaces, alternative therapies, and various modes of entertainment to address issues related to peer interaction, independence, privacy, and boredom. This optimizes the experience for adolescents, allowing them to maintain their existing peer relationships and engage in age-appropriate pursuits during hospitalization. Using Evidence-Based Design principles, this proposal for a new ward prototype specifically catered to ages 12 to 18 provides designers further understanding of this population, their unique needs, and potential solutions to meet the latter.

*Keywords:* adolescents, healthcare, socialization, ward design, evidence-based design

### Evidence-Based Design Decisions to Promote Social Interaction

Evidence-based design (EBD) is commonly used in the architecture and interior design fields. This philosophy is simple: design decisions involving the built environment should be rooted in credible research in order to achieve the best outcome (“About | The Center for Health Design,” n.d.). Research has shown that adolescents have specific developmentally-rooted needs and desires, and therefore need a unique space within a hospital to best promote their healing processes. The result is Shift, a new healthcare design prototype that combats the major issues revolving around adolescents in healthcare environments. The most prominent issue Shift seeks to resolve is the need for social interaction amongst adolescents while still allowing patients the privacy and independence of their own rooms. Accommodating these needs presents a new design problem that requires unique design solutions for different physical spaces. As explained later, there must be various public and private areas as well as accommodations for social interaction for patients who are unable to utilize to the designated public spaces. Using research to support all design decisions, Shift accommodates varying personality and patient types while providing the necessary features to promote a positive healing environment for those in this developmental stage bridging childhood and adulthood.

### **Background**

Adolescence can be defined in many ways. Chronologically, it is the second decade of life (Allison Hutton, 2005). This is an age of transition, change, and maturation. Because adolescence is marked by relatively rapid physical, social, and role-oriented changes, adolescents can experience dramatic shifts in mood. These shifts are also influenced by the strain of being in-between childhood and adulthood, and having to navigate life with unclear boundaries and expectations. Because of these transitions and changes in their bodies and lives, adolescents may

feel lonely, anxious, or concerned for their future, while also experiencing happiness, excitement and readiness to face new challenges (Hutton, 2005). This turbulent emotional state requires a specialized standard of inpatient treatment, making adolescents the most difficult age group to care for in a hospital environment. In addition to changing emotional states, adolescence is a time of substantial physical growth and maturity. While all patients are classified as adolescents, the age range differs greatly. A late teen has very different perspectives and needs than a twelve-year-old. These differing ages require more adaptable design solutions to accommodate the needs of the spectrum.

The age of adolescence comes with a unique set of needs and characteristics. The amount of maturity and development that happens during this second decade is unlike any other era of life. Most notably, adolescents tend to have labile and self-centered emotions, explore and assert their personal identity, value peer relationships over others, strive for independence, and test rules and boundaries (Van Aken, Van Lieshout, Scholte, & Branje, 1999). These traits are at the core of what drives the adolescent decision making process. Every life event and social interaction is interpreted through this lens, and is influenced by the primary needs for independence from parents and affiliation with peers. The characteristics of adolescence are only intensified during hospitalization (Clift L, Dampier S, & Timmons S, 2007). When being hospitalized for even a short period of time, both of these primary needs are thwarted. Adolescents must rely on authority figures (i.e., parents, guardians, healthcare professionals) to get the necessary treatment, while being restricted from normal day-to-day social activities. Those that are separated from friends, family, and peers may perceive a loss in social status within their peer groups (Hutton, 2002). In addition, adolescents are in a critical period of their education. A break in education can cause them to fall behind in school, and holds the risk of

grade repetition, separating them from their peer cohort. The disruption of social life and education, as well as the lack of independence, are the major downfalls of many current adolescent treatment protocols. With this new prototypical design, the physical environment helps to account for this disconnect.

The current medical standard is to physically place adolescents on a case-by-case and room availability basis. Despite frequent studies and recommendations for a designated adolescent ward, many adolescents are still being admitted to either children or adult wards where their specific developmental needs are not considered (Allison Hutton, 2005). Adolescents can still be treated effectively in the wards currently available, but they are not receiving care that is targeted to their age-group specific needs. The new design adds benefits that are necessary to foster an ideal healing process. While health professionals operating by the standard protocols are doing their best for adolescents, Clift, Dampier, and Timmons (2007) suggest that “[pediatric] services frequently ignore adolescents’ growing independence, while the adult medical culture neglects growth, development and family concerns” (p. 197). Whether it manifests as an entire satellite campus or a small ward within the greater hospital, a designated adolescent treatment area could not only better meet this populations’ needs, but also provide a marketing advantage for hospitals. Depending on size, location, and severity of illnesses, Shift can be adapted and catered to an existing facility. This prototype can mold to the different occupancies and be unique to each new healthcare environment. Adolescents deserve the best treatment possible and a new prototype and protocol makes this attainable.

### **The Design Problem**

Adolescents would benefit from their own ward within the greater hospital that addresses their unique social, developmental, and independent needs. This need creates an entire new set

of healthcare design issues. Adolescents have a strong desire for independence, yet they still rely on their parents/guardians for care and financial support. Teenagers enjoy privacy, as well as strong peer relationships and social stimulation. During teenage years, emotions are often fluctuating and contradictory, which makes this a unique and challenging design problem.

The need for a specialized facility is becoming even more apparent. In 2005, Alison Hutton stated that “[pediatric] hospitals acknowledge that the adolescent cohort would benefit from their own purpose-built environment” (p. 537). Pediatricians see this need and support the research as well. This need sparks from issues of boredom, privacy, and independence amongst the patients. Research suggests that age appropriate aesthetics, increased normalcy, and opportunities for peer interactions are valuable solutions to these issues.

Age appropriate aesthetics can benefit the patient in many ways. While adolescents are still attracted to the bright colors of childhood, they often reject the symbols and emblems, such as bears and balloons (Blumberg & Devlin, 2006). A more mature space that incorporates the colors of childhood and the imagery of adult facilities would create the optimal healing environment for this age group. In the same study, patients expressed the importance of a patient room that looks like a bedroom, and is customizable to their preferences. In the hospital, the patient’s room becomes their territory, something very important to today’s adolescents. The ability to personalize, hang posters, choose the music, have guests, control the television, and make the space their own is perhaps the most important element of the room (Blumberg & Devlin, 2006).

The privacy needs of adolescents must also be addressed in the patient rooms. Blumberg and Delvin (2006) state, “adolescents, who are often at a stage in development where the need for autonomy and a sense of self is already a struggle, may find any loss of privacy in the

hospital even more threatening” (p. 297). Privacy needs have a wide range, from private bathrooms to full coverage pajamas. The prototype cannot control the clothing issue, however, adaptable privacy solutions are needed. Private bathrooms are a primary design recommendation for adolescent wards, due to the issues of personal modesty and privacy. In junction with the bathroom, providing a space where patients can change and store their own clothing would make the experience more familiar. Creating a normalcy in the living environment could boost morale and decrease healing times. Addressing the aesthetics and privacy needs of this age group is the most important aspect of the design.

With school, extra-curricular activities, and the need for adequate sleep, adolescents are generally the busiest age group. Once placed in the hospital environment, patients feel restrained by the limitations of the hospital. Being confined to one particular room stands in contrast to the normative, busy life of an adolescent, and anxious attitudes and boredom often result (Blumberg & Devlin, 2006). In Blumberg and Delvin’s (2006) study, participants expressed interest in exercise areas, accessible kitchens, game rooms, and libraries. Teens of the twenty-first century have new perspectives on fitness and health, making the desire for exercise areas inevitable. Providing these spaces will allow adolescents to continue with some of their normal daily routines, while combatting the boredom symptoms of sitting in their hospital room for extended periods of time.

The prominence of social media and long hours in school keep adolescents digitally and physically connected to their peers on a constant basis. When placed in a hospital setting, the physical contact is suddenly removed. Due to this drastic change, social settings in the facility become more important. During adolescence, friends provide a sense of self-worth, and a comfortable platform to express emotions (Blumberg & Devlin, 2006). Therefore, providing



places where patients can interact with each other is imperative. Similarly, providing less restrictive visiting hours or spaces where patients can “hang-out” with their visitors is equally as important.

Independence and autonomy must be addressed. Adolescents want to be involved in their treatment and the decision-making process. Often, patients of this age feel they are being ignored and that they do not have the doctor’s full attention (Day, 2011). Legally, parents and guardians must be involved in this process, but the focus should be patient-centered. Similar to adult patients, adolescent patients also want to feel that their healthcare is accessible and understandable. Providing opportunities for independence allows patients to feel involved in the process as well as the ability to access, research, and understand the medical processes and terminology. This can manifest through active input in healthcare decisions, access to medical information, independence in bathroom usage and food selection, and customization of the patient room.

As noted above, the extended stays in hospitals can take a toll on an adolescent’s education. Not only are teens missing social relationships and activities, they are also falling behind on schoolwork by not attending class every day. Providing a space, such as a media center, where students can work together, or receive help from a tutor would be highly beneficial and further the youth’s independence.

Overall, the need for a specific adolescent ward is easily defensible. There are many factors and considerations that contribute to the overall design problem that need to be addressed. Adolescents need their own ward to promote healing and their specific needs. A Department of Health and Human Services study states that “Children and adolescents 1 to 17 years old represent 24 percent of the population, but only account for only 5 percent of hospital

stays” (“Care of Children and Adolescents in U.S. Hospitals: HCUP Fact Book No. 4,” n.d.).

While this may not seem significant, in a larger hospital system, five percent could be as many 50 beds. When implemented, Shift would benefit larger hospitals that can support the additions. Caring for adolescents in this new prototype will help to improve quality of stay for that portion of the hospital.

## **The Design Solution**

### **Concept**

As previously stated, adolescents are challenging rules, discovering their personal identity, asserting independence, navigating hormonal and related mood changes, and developing faster than any other age group. When comparing the uncertain attitudes of adolescents with the overall structure and evolution of medicine, it is evident that they are polar opposites. Medicine relies on a specific framework and regimented timetables. The contrast of the rapidly evolving teenager with the rigid structure of healthcare is the driving force of the prototype. Current healthcare design methods have to be questioned: are health care facilities truly accommodating the needs of the adolescent population? This design proposes additional spaces and technology to foster collaboration and social interaction. Shifting forms, earth-toned materials, saturated color, furniture, natural daylighting, and sociopetal and sociofugal concepts cater to this age group and contrast with the norms of healthcare design.

**Form.** Because the style and standard of care should be shifted to accommodate adolescents, the forms of the space should do the same. By pushing, pulling, extruding, and shifting the existing framework, the hospital mimics a Jenga structure. The basic framework of the building is still present and prominent, while the shifting elements are layered on top, creating a unique geometric form. These shifted and extruded elements are the most prominent in

large volume and vertical spaces; however, materials, millwork, and floor plans incorporate the shifting forms as well.

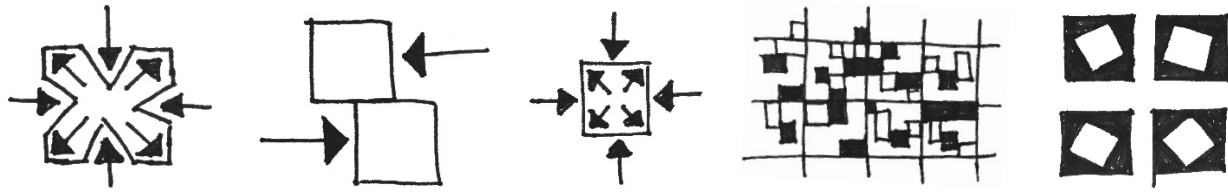


Figure 1. Concept sketches.

### General Spaces

Adolescents have a strong need for both private, quiet spaces and public, social spaces. To accommodate both of these needs, Shift incorporates both sociopetal and sociofugal spaces. Traditionally in architecture and design, sociopetal spaces promote social interaction with radial, open floor plans and furniture that faces towards each other. In contrast, sociofugal spaces typically use closed plans and furniture that faces away from each other to inhibit social interaction and provide more private and modest spaces (Meagher & Marsh, 2017). Shift calls for a divide into two main areas: public and private. Both sectors include a central atrium bringing in natural daylight to all areas of the hospital. The private areas provide adolescents with spaces for rest and healing, while public areas focus on social stimulation and maintaining existing relationships. These public areas help to combat boredom and resistance to treatment. Combined, these two sectors provide adolescents with the ideal space for faster recovery and social stimulation.

**Technology and Access.** Providing solutions for independence is one of the most important design issues for this age group. Having the ability to perform daily tasks is important and valuable to a teenager's growth and development. Shift aims to provide patients with as much independence as possible. The main design solution is to use contemporary technology to

monitor patients and track their activities or restrictions. Much like an office id tag, Fitbit, or Disney MagicBand, patients' hospital bands will have their allergies, dietary restrictions, access cards, and medical history accessible with the tap of the band. For example, if a patient is in the food court and wants to eat dessert, but their doctor won't allow it, the band will have that restriction and will not allow them to purchase the food. Another example is if a patient wants to go to the physical therapy room, but is not allowed to have strenuous exercise, the band would not allow them to enter. With the use of RFID and Bluetooth technology, patients will have more independence to walk around and participate in activities, but they will still be held accountable to their medical restrictions.

**Natural Light.** Adding an atrium in both the public and private sectors allows for natural light to penetrate all floors. Much like lightwells in multistory office buildings, Shift's proposed atrium spaces allow every room to have exposure to natural light. Patient rooms on the perimeter have large, historic warehouse windows to provide ample natural light while central spaces have the opportunity to receive natural light from the atriums penetrating all floors.

It is no secret that natural light improves any space, promotes healing, and is preferred by most occupants. All evidence-based design strategies integrate natural light and stress "the importance of nature and daylight on reducing pain, stress, lengths of stay, and spatial disorientation, and on improving sleep and staff satisfaction" (Day, 2011). Research shows there is a direct correlation between access to sunlight and decreased length of stay. In a study of 600 patients with heart conditions, patients who had sunlit rooms had an average stay of 2.3 days. In contrast, those with limited access to daylight stayed an average of 3.3 days (Derman, 2005). The patients in the study obviously benefited from daylight; therefore, it is concluded that the adolescent population would also be affected positively. Overall, access to natural light is

generally preferred, but must also be controllable. This design incorporates the daylighting in every room with controls such as blackout curtains and sun shades for particularly bright days.

**Acoustics.** In a healthcare setting, acoustic properties are essential. With an adolescent population, acoustic boundaries directly respond to privacy needs. Even though this age group is typically more social, they have the greatest need for modesty and privacy. For Shift, acoustics help to distinguish between the public and private areas. First, the private areas need to feel intimate and quiet, as opposed to the louder common areas. In the medical sectors of the facility, acoustical ceiling tiles (ACT) with a high noise reduction coefficient (NRC) rating provide an even coverage of sound absorbing materials. Additionally, the patient window curtains have a high sound transmission class (STC) rating, which helps to combat the noise from the courtyard or street. In the more public medical areas (i.e. urgent care), acoustic curtains provide additional audible privacy as well as support the privacy standards of HIPAA (Health Insurance Portability and Accountability Act).

**Materials and Aesthetics.** The current aesthetic trends for adult healthcare tend to focus on direct references to nature and curvilinear forms. In contrast, pediatric facilities tend to focus on primary colors and meeting the needs of visual stimulation for young children. This adolescent facility combines these two norms to create a new aesthetic that strives to appeal to all the maturity levels. By morphing the two aesthetic trends of pediatric and adult healthcare, Shift mimics the transition from childhood to adult life. Taking inspiration from the hospitality industry, luxury vinyl tile and heterogeneous sheet goods emulate hardwood floors found in hotels and homes. The warm, inviting tones contrast with the saturated colors of the furniture and walls to create a unique, youthful aesthetic. These upgraded finishes challenge the standard aesthetics of healthcare design to create a warmer, more hospitable healing environment. As seen

in Figure 2, the color scheme mimics the traditional primary colors found in pediatric wards, but with a twist.



Figure 2. Color and material scheme.

**Wayfinding.** Hospitalization is inherently frightening, complex, and overwhelming. Adding the difficulty of navigating the physical space to the already heavy emotions, a patient only becomes more frustrated, stressed, and scared. Therefore, it is necessary to incorporate distinct signage, as well as additional directional cues (Zeit, 2014). However, it has also been found that additional signage only compounds the anxiety (Murphy & Brown, 2010). The solution must answer both of those issues; by providing directional cues without overwhelming signage, this design prototype can combat the overuse of traditional directional signage.

An effective wayfinding program includes “physical elements, communications, and human interaction” (Murphy & Brown, 2010). Shift’s wayfinding solution incorporates all three of these needs. First, there are physical wayfinding signs placed in each floor’s elevator lobby. These “wayfinding walls” use a progressive disclosure approach, meaning that patients are only given the information needed to progress to the next step (Zeit, 2014). For example, on the first floor, the wayfinding has generic cues for each floor, such as: Fourth Floor - Imaging. After the patient makes it to the fourth floor, the wayfinding is more explicit with directional cues to x-ray, MRI, and CT. The wayfinding walls feature an interactive component as well. This tactile component can empower the adolescent to be more independent when navigating, as well as be a distraction and entertainment element. This can, in turn, make the experience less stressful for a parent or guardian accompanying the patient. This touch screen display features a map of the

hospital with detailed information of what is on each floor. Because this is a unique and trend driven age group, incorporating technology is ideal. However, the visitors and family members may not be quite as tech savvy, leading to confusion and frustration before the journey even begins (Zeit, 2014). Incorporating both tech-driven and low-tech directional forms caters to all visitors using the space. Physical wayfinding is also used for each room throughout the hospital. Each patient room has a clear room number with an area for personalization. This personalization allows the patient to display their name to make it clearly visible to visitors and other hospital personnel. If they choose, this space also becomes a way for patients to introduce themselves by including favorite foods, favorite musicians, or any other personal touches they may want to add.

Second, both verbal and non-verbal communication is present on each floor. Verbally, the physical signage directs a guest to their end destination. Non-verbally, a defining color is assigned to each floor. These non-verbal cues are useful to those who frequent the space. First time users need to have explicit wayfinding tactics, while seasoned guests rely on the non-verbal communications to ensure they are in the correct area of the facility (Zeit, 2014).

Lastly, Shift utilizes human interaction in wayfinding. Throughout the space, hospital personnel stations are frequent and open. Having more open layouts allows patients and visitors to ask questions if needed. The floor plan itself is inherently more navigable. Currently, healthcare facilities are moving towards de-centralized plans, making wayfinding challenging (Murphy & Brown, 2010). Shift uses a centralized plan on each floor, making the facility easy to navigate. Each floor is oriented in the same manner so that regardless of which floor a user is on, they already have a general idea of which direction to go.

**Lighting.** In addition to the natural lighting of the atrium and exterior windows, this facility incorporates unique, current lighting technology that is often found in hospitality spaces. These systems correlate with sunlight and are sensitive to circadian rhythms. By combining the features of hospitality with the structure and needs of healthcare, the lighting design creates a unique space to distract from the regimens and medical aesthetics, as well as normalize sleeping patterns during hospitalization.

Throughout the hospital, the lighting aims to be as discrete as possible, while still providing the appropriate amount of lux for daily tasks. For Shift, this manifests as recessed linear fixtures in all areas along with pendant lighting where accents are needed. The main lighting design feature is the programmable LED lamps that automatically change color temperature according to the time of day to normalize circadian rhythms. Circadian rhythms are the natural cycles present in all humans that tell a person when to eat, sleep, and rise. These rhythms are linked directly to the color temperature of sunlight. Disruption of the daily cycle can lead to sleep deprivation, depression, obesity, and many other illnesses. Research shows that artificial light that mimics the color temperature changes of sunlight help to normalize circadian rhythms and contribute to normal sleeping patterns (Engwall, Fridh, Johansson, Bergbom, & Lindahl, 2015). Each day, sunlight transitions from a very cool color temperature (bright blue) in the early morning to a warm color temperature (orange) in the evening. Humans' natural circadian rhythms are trained to rise with cool, blue light and rest with warm, orange light. Artificial lights and devices are constantly emitting a single color temperature of cool light, confusing the natural rhythm. Much like the "night shift" feature on iOS devices, color temperature change in artificial fixtures and devices reduces strain on the eyes and creates an easier transition from having the lights on (or staring at a computer/phone screen) to sleeping.



When combined with natural light exposure, color shifting LEDs are preferred by hospital patients (Engwall et al., 2015).

Since circadian rhythms are linked directly to sunlight, all of these color temperature preferences relate directly back to the principles of biophilia. Biophilia is “the idea that humans possess an innate tendency to seek connections with nature and other forms of life” (Burres, Edwards, Beck, & Richards, 2016, p.000). Sunlight is arguably the most essential element of the natural world, making it one of the most important natural elements to incorporate into the built environment. By linking the artificial lights with the natural light, patients have improved hospital stays and, in turn, shorter hospital stays.

### **Public – Social Spaces**

Adolescence is arguably the era of life in which social interaction is most central. When hospitalized, adolescents experience a profound lifestyle change. They are entering a foreign environment of sights, sounds, and smells without the comfort of knowing fellow patients (Lambert, Coad, Hicks, & Glacken, 2014). As noted before, this can be a particularly stressful experience. Adolescents often view hospitals as both clinical spaces, and as venues of social experience (Lambert et al., 2014). Because of these views, adolescents want the space to have age-appropriate recreation, and foster fun and active engagement with new and old friends (Lambert et al., 2014). Shift provides these spaces throughout the facility to support the overwhelming need for social interactions. These areas have glazed curtain walls that provide an audible barrier without limiting sight lines. Social situations can often be intimidating, especially in a new environment. This transparency allows adolescents to assess the environment to decide if they want to participate before entering. Additionally, parents and guardians are able to sit outside the room away from noise while still watching their teen. Throughout the facility, this

idea is implemented in areas including lounges, a mall-like food court, shopping kiosks, gaming areas, a media center, and recreation room that doubles as physical therapy.

**Lounges.** Throughout the hospital, various lounges provide opportunities for more social interaction amongst patients and visitors. On the fourth level, the public half of the floor is filled with lounge spaces, both intimate and open. In the large, open lounge, patients can visit the technology counter and “check-out” an iPad, laptop, board game, or any other related entertainment and “hang out” in the provided spaces. This open lounge also serves as informal meeting spaces for support groups, doctor-patient conversations, or just old-fashioned fun. Additionally, on the fourth floor, there are designated quiet and gaming rooms for patient use. These explicit areas are highlighted in Figure 3 below.

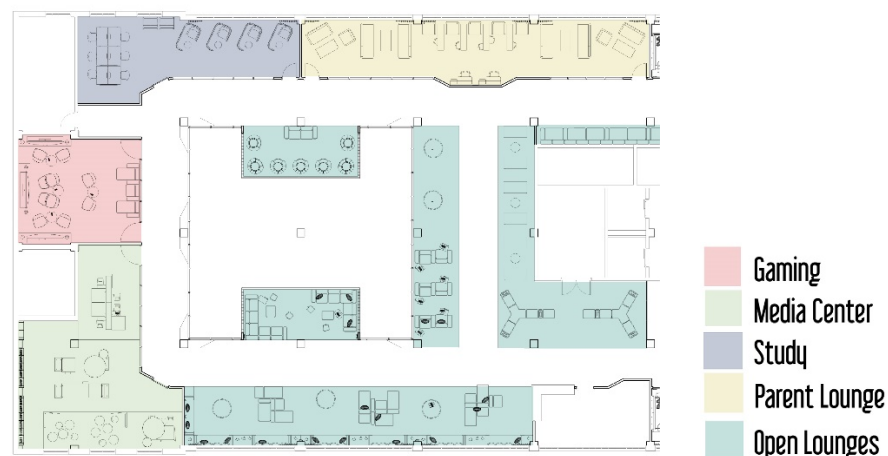


Figure 3. Fourth floor lounge spaces.

**Gaming.** In this space, patients and family members can use one of the various entertainment units to play video games and watch movies on a bigger screen or interact through the internet. With “funky” lounge furniture and several gaming consoles, this space accommodates all patients who enjoy gaming and virtual social interaction. With an online gaming lounge, patients can stay connected with existing virtual friends as well as making new connections with other patients in the hospital. This space caters to the more technologically

savvy teens while the other lounges cater to other personalities and interests. For more traditional game options, the plaza level has a game lounge with table tennis, air hockey, and pool tables. This lounge promotes movement amongst the patients while not having to exert too much energy. While one might argue that gaming does not always promote a healthy lifestyle, Shift strives for normalcy. If a child is normally stationary for part of the day and making connections online, it is important to provide a space where they can continue this daily routine. Gaming can also be educational. For instance, there are games that teach building and planning, so the teens also have the opportunity for mental stimulation. Taking away a daily activity could have a more negative effect than providing an activity that might not be deemed suitable for a normal healing environment; it may also help those who need to be encouraged to be more sedentary as part of the recovery process. The virtual gaming lounge plan can be seen in Figure 4 below.

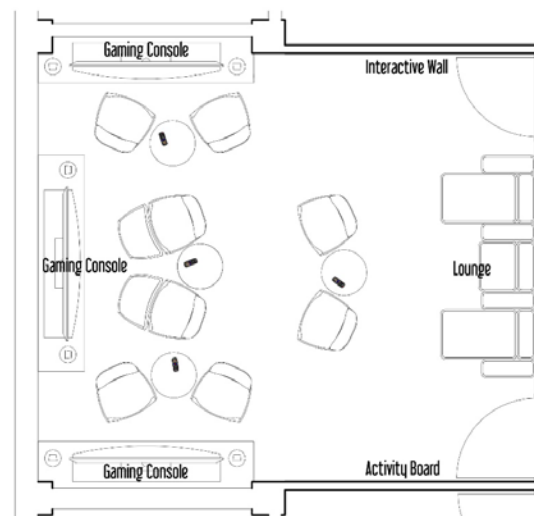


Figure 4. Gaming lounge plan.

**Media Center and Study.** On the fourth floor, Shift provides a designated study lounge where patients, if they so choose, can stay up-to-date on their schoolwork, and also receive help from their peers or volunteer tutors. This space is meant to be adaptable to any and all patients' academic needs. Because all students learn differently, this space provides standard reference

books, access to online learning tools (i.e. Kahn Academy), and new technology to accommodate all learning styles. Both sociopetal and sociofugal furniture arrangements are included which accommodates both private and collaborative learning. For more privacy and quieter working, Steelcase's Brody system provides individual working pods. Simple benching desks allow for students to work individually or collaborate with a neighbor. Having the ability to maintain their education during an extended stay is vital for this age group, and Shift provides all the necessary resources to ensure this is possible.

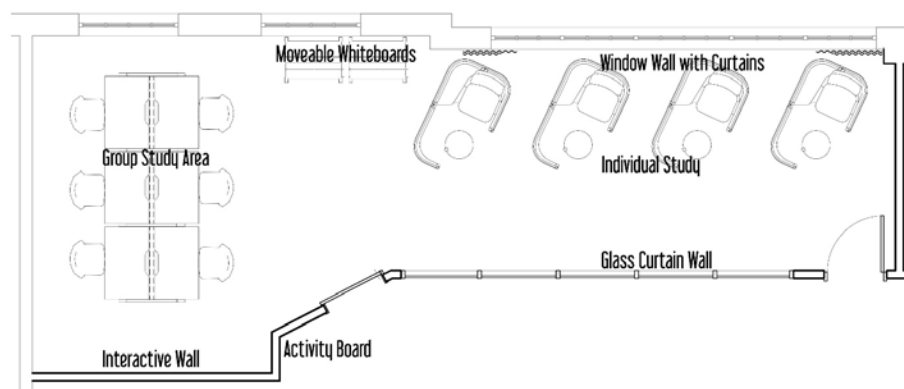


Figure 5. Study lounge plan.

The fourth floor is also home to a media center that serves as a second quiet space for individual use or group meetings. These two designated spaces have relevant design and location aspects to encourage a focused learning environment. Social interaction is important for all adolescents, but it is important to accommodate all ranges of this interaction. More introverted teenagers will appreciate the opportunities to collaborate and interact in these more intimate spaces while still having the same opportunities as the other more extroverted patients. In addition, adolescents are typically in a busy time in their academic careers, where missing class can take a toll on their grades. The study lounge provides a designated space where tutors, peers, and individual patients can go to catch up on their studies or collaborate. This study space provides both open and private working spaces. The media center fosters more of a quiet lounge

atmosphere with sofas, cushioned stools, and mobile tables for technology. In this space, patients can choose to be as social or private as they wish. While most kids probably enjoy time away from school, having the ability to carry on with normal, daily activities, such as homework, allows for some familiarity and normality to an extended stay in the hospital.

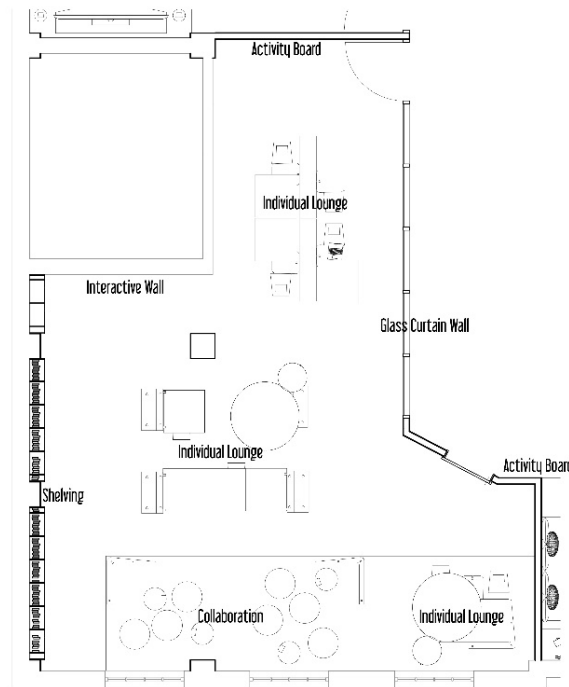


Figure 6. Media center plan.

***Intra-hospital network.*** While having physical interactions are vital to a teenager, sometimes, this is just simply not possible. For patients who are confined to their bed or are in isolation, an intra-hospital social network provides social opportunities to these patients. In theory, this network will have attributes similar to Skype and Google Hangout, as well as a chat room and instant messenger. These features allow the patients to “meet up” on a digital platform, which can lead to face-to-face interactions later. All of these features allow for patients to connect with their peers inside the hospital, and relate with those going through similar emotions, without having to break their medical restrictions. The same system is then applied to contacting

friends and family outside of the network. Patients are then able to use the same technology to maintain existing connections throughout their stay. Within the individual rooms, patients have two large, wall-mounted monitors equipped with Internet and webcams. Here patients will be able to stay connected without having to leave their beds. Elsewhere in the hospital, patients can utilize the activity screens in each room. These screens will have the events and chats for each social space allowing patients to explore the atmosphere and activities before fully committing. Additionally, patients will be able to check out tablets to use during their stay. These devices will also be connected to the hospital network and outside peers so that patients do not miss any social interaction, if they so choose.

**Physical Therapy.** Physical therapy is central to a number of injuries and illnesses. However, it can often be intimidating and sometimes boring, making children and adolescents apathetic towards their recovery. Shift aims to change this stigma and create a more fun and entertaining space. On the second floor, the physical therapy rooms have all the necessary equipment (i.e. stairs, parallel bars, exercise bands, etc.) in addition to more unique ways to promote movement. In this space, two basketball goals with hardwood flooring and soccer goals with synthetic turf provide unique places for patients to practice walking and other daily exercises while enjoying their time. Technology is integrated into this space as well. Large monitors and wireless controls allow patients and therapists to interact with motion games, music, and activities to encourage patients to be active, within their limits, during their stay. Contemporary gaming systems incorporate movement into the activities. In the physical therapy space, monitors, Xbox Kinects, and Wii systems are used as alternatives to the traditional therapist-patient interactions. This space provides new and intriguing alternatives to therapy that can encourage teens to cooperate with therapy procedures, resulting in faster recovery and

increased positive morale. These large spaces can also be used for meetings or group exercise events in the hospital. Regardless, these areas strive to get patients excited about moving and, in turn, recovering faster in a more positive environment.

### **Private Spaces**

Because adolescents have a unique need for privacy, in addition to daily social stimulation, the patient room becomes a critical space. For Shift's hospital design, the patient rooms, outpatient exam rooms, and supporting areas become the primary private zones in the overall facility. Having these zones as a direct counterpart of the public areas allows adolescents to stimulate all sides and needs of their personality.

**Patient Room.** As the primary private area for each patient, the patient room must address several concerns: boredom, modesty, and independence. The current generation of adolescents is busier than ever before. Amongst extra-curricular activities, constant interactions on social media, and higher academic standards, teenagers are rarely inactive. When placed in a healthcare environment, it is essential they are able to maintain this momentum, but this is difficult when confined to their patient room, making boredom one of the main problems facing adolescent healthcare designers. Shift's patient room uses technology to provide multiple solutions to this issue. Because this facility focuses on social interaction, each patient room is equipped with communication technology so that the adolescent can be in contact with friends from school or other patients in the hospital. Entertainment technology is integrated as well. Depending on preferences, patients can use the provided technology for gaming, social media, or movies, allowing them to stay connected or entertained throughout the day. This technology also doubles as a medical tool. When physicians need to better illustrate a particular procedure or illness, the portal viewed through television screens provides an ideal space to display this

information. Tablets from the technology check out station, or a doctor's tablet, can be used in this same manner as well. While doctors' explanations are valuable, adolescents often want to be independent in their knowledge pursuits. This technology provides patients the opportunity to research their illness or procedure, and find the information independently. To ensure the correct information is accessible, the hospital will provide a portal with designated databases or websites for the patients to use. As a result, patients will feel more informed and involved in their treatment plans.

Teenagers often choose to be modest and private when it comes to their bodies. While the patient room has clear access to the hall and staff, there must also be a solution to create a completely private patient room. By using LCD privacy glass (a type of glass that can be transparent or completely opaque with the flip of a switch) and privacy curtains, the design is versatile, allowing the patient to be as social or private as they choose.

Adolescence is a time to gain and find independence. The reinvented patient room allows for the patient to be completely independent. With wireless technology, accessible restrooms, and clear sight lines, a patient might be able perform daily tasks without the aid of a family member or hospital staff.

**Plan.** The typical patient room contains three zones: clinical, patient, and family (Vickery, 2011). The clinical zone should accommodate the nurse and doctors, including medical supply storage, sink units, and a landing space for charting technology. The patient zone includes all the essentials for the patient, including a bed, headwall, bathroom, and sitting chair. The family zone must accommodate several activities in the limited space. For adolescents, family members tend to stay overnight in the room with the patient; therefore, providing a space for an adult to sleep is imperative. Having a workspace for the same adult is also essential.



Often, guardians are taking time out of their lives to be with the teen, so a workspace that supports a laptop is necessary. This space allows the guardian to work or to stay connected with their social and support networks. Shift fosters social interaction for all parties involved in the healing process, including the guardians (Vickery, 2011). The family zone needs to also accommodate daytime guests. Whether it be family, peers, or school friends, adolescents often want to be able to host those guests throughout their stay (Vickery, 2011). Combined with technology and boredom combatants, these three zones are at the core of a successful patient room. An example of patient room zones can see seen in Figure 7 below.

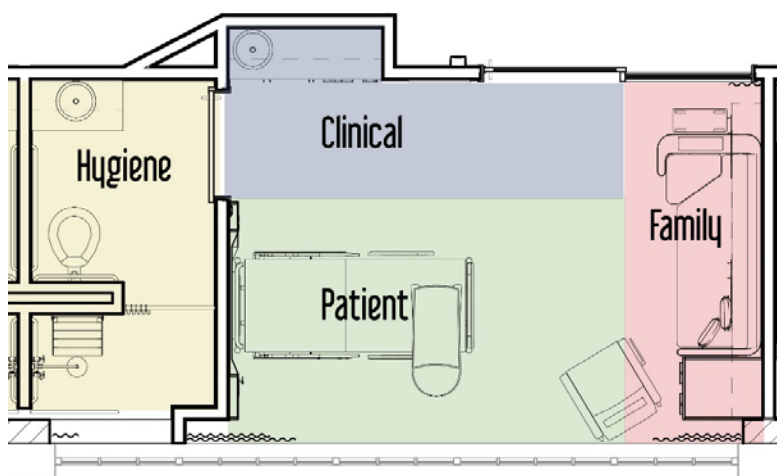


Figure 7. Patient room zones.

Harper, Watkins, and Minnier (2014) recently argued that smaller patient rooms lead to increased patient satisfaction. While a smaller patient room fits this trend and also conserves construction costs, using a smaller footprint requires the space to be extremely efficient and flexible. In one of their recent patient room designs, Harper, et al. (2014) explain that the family zone was moved from its typical location under the window to the foot of the bed, creating more opportunity for face to face interaction with the patient. In addition to more interaction, providing a designated family zone allows those family members to feel less “in the way”

(“Outward-looking Design Trends to Improve Healthcare Environments,” n.d.). The clinical zone is positioned close to the door so that staff can cause minimal disruptions to the patient (Harper et al., 2014). However, when staff do interact with the patient, it must be engaging and open. Movable or wall mounted technology allows for all parties to view information, and doctors do not have to turn their backs to the patient while viewing a computer screen (Harper et al., 2014).

This new patient room incorporates these three essential zones in an atypical layout. The first application of the Shift prototype is for Carolina Hebiatric, which is located in an existing building in Durham, North Carolina. The existing building that is being renovated has large, warehouse windows, requiring an atypical patient room plan. The patient room is oriented in a more landscape plan rather than the typical portrait or square units commonly used in patient rooms today. This redesign results in a smaller patient room, supporting the argument for decreased room size. As the previous example moves the location of the family zone, Shift follows suit. Orienting the family zone to face the patient creates and fosters more social interaction within the private area. In this case, the clinical zone remained close to the entrance so the staff would not disrupt the patient when conducting routine check-ins, maintenance, or cleaning (Harper et al., 2014). Shift, continues this trend by providing an explicit clinical zone on the north wall of the room. For an extended stay, patients generally want to bring their personal belongings, which requires a place to store these items (Vickery, 2011). Shift incorporates personal and family storage into the family zone on the east wall. Maximizing the wall space is imperative as the existing large windows limit the amount of usable wall space.

The patient restroom is completely accessible in every room. This is the ultimate universal design element. As required by the American’s with Disabilities Act (ADA) all public

facilities must provide equal accommodations for those who are impaired. Shift aims to go beyond these basic regulations by making virtually every space accessible. Using ADA and universal design principles, each patient room is completely accessible, accommodating patients and visitors with disabilities. Because each room is accessible, patients confined to a wheelchair due to inpatient procedures are able to remain in the same room. This extra circulation space also accommodates the maneuvering of the hospital bed for surgery transport. Additionally, there is no limit to how many accessible rooms are provided. Essentially, there is no cap on how many physically disabled patients the hospital can accommodate. Arguably, every healthcare facility should make every patient room accessible; however, it is simply not possible in every case. The unique floor plan of Carolina Hebiatric allows Shift to accommodate these ADA regulations and universal design principles. A typical patient room layout can be seen in Figure 8 below.

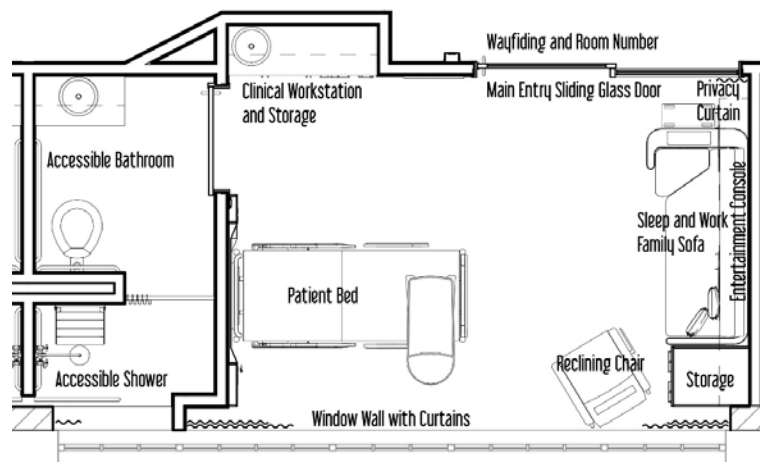


Figure 8. Patient room typical plan.

***Hospitality Design Influence.*** Healthcare design is trending towards using other design project types as inspiration to develop new patient care strategies. These trends are focused on patient and family centered design as well as the aesthetics of the facility. For the patient room, designers are looking to hospitality design for inspiration and solutions (“Outward-looking Design Trends to Improve Healthcare Environments,” n.d.). Hospitality is focused on comfort

and stress relief, two elements that promote healing and wellness. This includes offering amenities that make users feel relaxed and “at home” (“Outward-looking Design Trends to Improve Healthcare Environments,” n.d.). Hospitality trends have already been implemented in healthcare around the globe with great success. By using the aesthetics and features of hospitality design, healthcare is “increasing the focus on patient and family centered design” (“Outward-looking Design Trends to Improve Healthcare Environments,” n.d.). In a hotel, personal food and beverage accommodations are standard, with refrigerators and snacks provided in the rooms or nearby vending options. Shift adopts this trend by including a small refrigerator in the patient room and vending on each floor. These additional food options are controlled by the hospital wide wristbands, limiting access to certain food groups if a patient is restricted. Including a designated family space, integrating technology, upgrading finishes, incorporating personalization areas, and improving lighting design, patient rooms are able to provide a more customizable and comforting environment.

### **Alternative Therapies**

Every patient rests and heals differently. There is no one way that aids recovery for every illness. By providing alternatives therapies, Shift strives to incorporate many options to promote wellness and healing for every patient. Because Shift incorporates adaptable and multi-purpose spaces, spaces to support alternative therapies are included throughout the entire facility. As previously explained, the designated physical therapy spaces include new technology to keep teens moving throughout their stay. To accommodate other healing options, the physical therapy spaces will also be a host to group yoga and meditation. In junction with physical exercise, meditation and mindfulness can be an important healing therapy. Because the spaces are multi-functional, as new therapies develop, they can also be hosted in these rooms. Additionally,

animal assisted therapy is housed in an individual room that is designed to accommodate those particular needs.

**Animal Assisted Therapy and Activities.** Animal assisted therapy (AAT) and animal assisted activities (AAA) are becoming commonplace in healthcare and rehabilitation facilities today. AAT requires a trained professional, regular routines and goals, and medical documentation to track the effects and outcomes of the therapy (Burres et al., 2016). AAA is considered less formal and is used to boost patient motivation, provide recreation, and encourage social interaction among patients (Burres et al., 2016). AAA is often conducted by an outside volunteer or local non-profit. Regardless, both animal assisted programs can benefit the psychological, physiological, and emotional states of every patient.

As previously noted, biophilia is the human tendency to seek connections with nature and other forms of life. This generally manifests as natural light, fresh air, live plants, and earth tone materials. Research hypothesizes that humans are emotionally affected by nature and exposure can boost morale and quality of life. AAT and AAA are arguably forms of biophilia. Interaction with animals can have a positive emotional effect on patients of any caliber (excluding those with severe allergies, asthma, etc). Whether they are suffering from aphasia (unable to understand or express speech) or depression, exposure to nature can aid in the healing process (Berek, 2013).

AAT has been used in rehabilitation facilities to boost the results of traditional therapeutic activities. When an animal is present during standard therapies, patients tend to respond and progress quicker. For example, when a therapy dog was present during a standing tolerance test, all forty-two patients in the study had improved mobility when compared to a session without a therapy animal (Burres et al., 2016). In addition, ninety-seven percent of

participants stated that the presence of the pet was comforting and that they benefited from the AAT program (Burres et al., 2016).

Today, healthcare facilities' therapy animals, typically dogs, can calm the patients and help them to manage pain and enhance the healing process (Berek, 2013). In a cardiac unit, the presence of animals resulted in much lower blood pressure and stress hormone levels among patients. AAT is most beneficial when dealing with emotional trauma, much like that of an adolescent being in an unfamiliar environment for an extended period of time.

To support the existing research, Shift incorporates a dedicated animal-assisted activity location. Located on the main floor, one space serves as an AAA space where patients can simply visit the animals and spend time away from their room. In the event that a patient is hospitalized long term, this area would be a space where a personal animal is allowed to visit during visiting hours. This space is designed to accommodate allergens, heavy use, and pollutant issues. Like most of the finishes throughout the hospital, the AAA space uses beach cleanable fabrics, vinyl wallcovering, and non-porous floors to combat maintenance issues and allergen exposure. All of the materials are extremely durable to accommodate the prolonged and intense use. If patients are unable to visit the dedicated space, the animals are also able to visit individual rooms, as long as the hospital allows permission. Overall, this space provides the patient an opportunity to heal with alternative therapies and experience a more normal routine within the walls of the hospital.

### **Conclusion**

Social interaction is essential to an adolescent's development and attitude. Hospitalization disrupts these daily interactions and causes teens to feel that they are being left behind or excluded from their normal social groups. These feelings then lead to apathy,

boredom, and emotional changes. With evidence-based design, Shift strives to solve these issues by adding more opportunities with design to foster peer connections, both face-to-face and digitally. With the use of sociopetal and sociofugal design strategies, Shift provides opportunities for private rest and healing as well as social stimulation. Combining lounges, biophilia, social spaces, a mall-like food court, and new technologies, Shift caters to adolescents with contemporary aesthetics, while still using calming and healing design features. By cultivating a positive healing environment, this new design prototype provides an ideal model for the future of adolescent healthcare design.

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